CORRESPONDENCE

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ATLANTANKERY

IN view of the various methods mentioned with the object of giving the Atlantic service a pay-load it seems surprising that no one has suggested tanking up *Caledonia* in the air. [Actually, some of the possibilities are discussed in an article on pp. 124a-124d of this issue.—ED.] Such a method should allow an extra loading because of the absence of take-off troubles, and even if no extra load could be permitted, the fact that the machine would be a matter of fifty miles nearer its destination before the filling process was complete would mean an extra 400 lb. pay-load in place of the fifty gallons saved on the first fifty miles. A gift of 400 lb. should not be overlooked; in fact, it might be a paying proposition to use one of the old four-engined restaurants to canter out a couple of hundred miles before tanking-up the greyhound, and then about 1,500 lb. extra could be taken.

The process has even a third possibility: two *Caledonias* set out together, No. 1 having 11,000 lb. fuel and 8,000 lb. extra pay-load; No. 2, 19,000 lb. fuel. No. 2 boat saves 8,000 lb. fuel for No. 1, and, having 11,000 lb. for herself, has a range of 700 miles or so.

The cost of each trip would be thus increased by about 70 per cent., but the pay-load more like 200 per cent., and neither boat would ever be overloaded.

A D.H. Albatross could be helped in the same way as an Empire type with, probably, better figures, but the main idea of filling in the air is the same as the composite arrangement which aims at getting a heavy machine safely on its way, and it seems a less complicated system. TANKA.

Huddersfield.

MAN-POWER FLIGHT.

I HAVE read with interest the comments in "The Outlook" of July 15 on my article on the above subject. "The Outlook" writer suggests that I "suffer from an excess of optimism" in the power needed to change the sloping path of a glider into horizontal flight and he suggests that I have "come unstuck" on the power that man can develop. Then he proceeds to produce figures of man's h.p. *which are identical with the figures I gave !!*

It is true that he puts more on the legs and less on to the arms, but I can assure him that he is entirely wrong in both statements, as I have been carrying out accurately measured tests for more than twelve months and can demonstrate them at any time. [See footnote 1 below.—Ed.]

With regard to the weight of the complete machine "The Outlook" paragraph suggests that the total weight will be some 70lb. heavier than I have specified. I do not think we have reached the last word in weight reduction and I am already in a position to satisfy the writer that he is wrong.

"The Outlook" then proceeds with a most pessimistic view to prove that the h.p. required would be nearly 1¼ *which is within the figure attainable that I specified and within the figure that the writer has confirmed!!* [See Note 2.—ED.]

"The Outlook" suggests that a machine such as I require would be large and fragile. Are not all aeroplanes large and fragile? I am, of course, aware of the "Katzmayr Effect" and of Mr. Townend's deductions, and whilst I have every respect for these theories, I do not believe that they will assist man-power flight.

I am convinced from the point of view of lifting capacity that the Wright Bros. were wrong in their original conception of the flying machine. I am satisfied that they had one thought only, and that was *to fly*, and that their ability to do this arose purely from the fact that they understood the basic principle, i.e., that the centre of lift must coincide with the centre of gravity and that any variation by varying air currents must be compensated by warping wings and elevator. They were not concerned with the most efficient method of aerial propulsion and they chose the bird's most inefficient feature, which is that of using its wings as glider planes.

I have studied bird flight for hundreds of hours and the more I study it the more I realise that evolution taking millions of years to produce its twentieth century model against ills like death from destruction has produced something that man would do well to study, not only from the point of view of flight but also from the point of view of a mechanical structure.

It is obvious that it is wrong to preface an article based upon entirely new aspects with reference to technical data based upon different aspects, especially if these different aspects are purely academical ones and working upon a different line of progress. In "The Outlook," for instance, you refer to the "apparent ease with which a bird can fly" and then suggest that I should take Mr. Townend's advice and build a machine "without using the large amplitude of oscillation used by a bird." This, of course, is self-contradictory and, in my opinion, my article should not have been prefaced by one that is lacking in imagination. If we had all lacked imagination there would be no flying machines to-day and I feel that I need only cite the two following statements to show how one can be led astray by academical considerations.

In "The Outlook" you suggest that "It seems to be largely a question of designing wings to have a natural period of oscillation which would suit the natural speed of 'rowing' (my suggestion) which the human power plant would adopt." Then you quote the final advice of Mr. Townend that "Even if the structural difficulties should appear great, it would seem to be worth while to know whether it is fundamentally possible to transfer the necessary power by the mechanism in question without using the large amplitudes of oscillation generally associated with the usual proposals of flapping flight." Now, it is obvious to any engineer that both these remarks are of the textbook order because it is perfectly simple to arrange any constant or varying speed of reciprocal and/or rotary-cum-oscillating action by means of the most elementary gearing, and in any case, what is wrong with "large amplitude"? Birds get on all right!

If "The Outlook" writer, who suggests that I "suffer from an excess of optimism," would like to indulge in a little education that might provide him with some degree of imagination perhaps he will study some of the fat and over-fed pigeons in Trafalgar Square, which, with wings half decayed with age, can rise vertically to the top of Nelson's Column, and he will realise that nature's method of flight, as the result of some millions of years with test, trial and error is many times more efficient than the most up-to-date aeroplane that man has yet devised.

London, W.1. GRANVILLE BRADSHAW.

(1) It is difficult to see how Mr. Bradshaw arrives at the conclusion that the figures quoted were identical with the figures he gave. In his article Mr. Bradshaw estimated that Oxford and Cambridge boat race crews "are each developing between 2½ and 3½ b.h.p. in a race of this description" (bottom of right-hand column, page 76c). Professor Hill stated that towing tests on a boat with crew aboard had indicated that the average power output per man was about ½ h.p. for 20 minutes.

(2) The "most pessimistic view" used to prove that it would require nearly 1¼ h.p. to convert the sloping path of a glider into a horizontal flight path was based upon Mr. Bradshaw's own premises. He took a *glider* weighing 230 lb. all-up (middle of right-hand column, page 77) and assumed that it would have a gliding angle of 1 in 30 in still air, but he coupled with that assumption the further one that the speed would be 8 m.p.h. It is important to remember that Mr. Bradshaw himself introduced the glider as the basis for estimating the power required. He did not, in that particular connection, refer to other possible means of obtaining lift, but was dealing with the *glider*. Now there is, of course, nothing difficult in calculating what sort of wing area would be necessary to enable flight to be made at a speed as low as 8 m.p.h. The formula is our old friend $L = k_L \rho A V^2$. From this it is found that if we assume for k_L corresponding to maximum L/D a value of 0.7, in the old-fashioned British "absolute" units, the wing area necessary to make it possible to fly at 8 m.p.h. would be 1,000 sq. ft. for a *glider* weighing 230 lb.! At 8 m.p.h. induced drag would be extremely important, and an aspect ratio of about 20 would probably be necessary if one were to have any hope of achieving a gliding angle of 1 in 30. Such an aspect ratio would necessitate a wing span of 142 ft. with a chord of slightly more than 7 ft. There was therefore some justification for advancing the view that it would not be possible to build a glider with a gliding angle of 1 in 30 for a loaded weight of 230 lb.

(3) Mr. Bradshaw has slightly misunderstood the intention behind the paragraph which suggested that Mr. Townend's advice be followed. The writer was not visualising that Mr. Bradshaw should take that advice, but that one of our research departments, either the N.P.L. or Farnborough, should devote a certain amount of time to examining the problems relating to oscillating wings.

The apparent inconsistency referred to by Mr. Bradshaw was due to lack of space in which to deal with the technical aspects of the